

The Value of Collegiate Education

A Second Look at Recent Graduates' Earning Prospects

Young adults, parents, and students are increasingly questioning the worth of a college education. Facing mounting tuition costs and in light of an economic recession which may not even be over, what was once a resounding yes is now turning into a befuddled shrug.

In response, the Obama administration announced plans in 2013 to rank schools by the statuses of their graduates, in an attempt to help prospective students select the right colleges as well as spur institutional reform. Now, those efforts have begun to bear fruit. Just last month, in September 2015, the Department of Education released a website called the College Scorecard, which enables the filtering of schools by alumni earnings and employment details, tuition, financial aid, diversity, and other metrics.

Perhaps more noteworthy was the accompanying public release of the relevant datasets. Now, for the first time, reliable data on post-graduation earnings is available. Previously, this information was compiled from self-reported numbers. College Scorecard's data, however, cross-references tax filings with student aid records in order to obtain reliable figures on earnings for all graduates that took out a federal loan. This unfortunately means that students who have not benefited from federal aid are not included. Nevertheless, the quality of this data far outstrips what we had in the past.

The data enables us to take a stab at two big questions: What kind of earnings and employment prospects do graduates from colleges across the United States face? And to be more specific, what of the prospects for Penn graduates?

Using post-school earnings data available at <https://collegescorecard.ed.gov/data/>, the earnings and employment prospects of graduates from ~7804 schools across the nation were analyzed and then compared to Penn's statistics. Two notes: the available data covers graduates 6, 7, 8, 9, and 10 years after enrollment, not immediate graduates, and certain statistics are unreported or suppressed for privacy reasons for different schools.

Statistics on unemployment rate of graduates was obtained via census data for 5710 schools. The calculated sample mean is 3.87%, with standard deviation of 1.217%. Consider that the Federal Reserve's estimate of the natural rate of unemployment hovers around 4.5-5%, and that the unemployment rate in the U.S. as of September 2015 is 5.1% (from the Bureau of Labor Statistics). Of course, these rates do not account for discouraged job seekers, which might be a disproportionately large subset of recent graduates relative to the larger population. They may also be higher than the past unemployment rates of recent graduates, say 15-20 years prior. Without more data it is difficult to draw further conclusions.

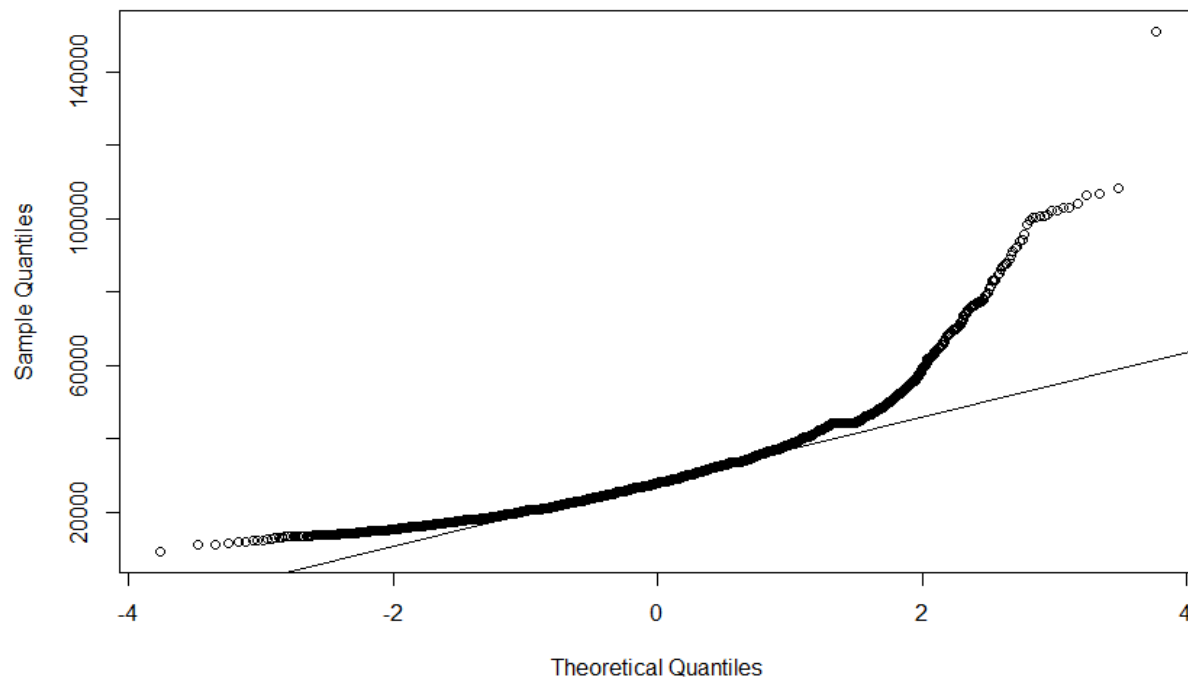
Statistics on the earnings of graduates 6, 7, 8, 9, and 10 years after enrollment are displayed, with a sample size of 5935 schools (some omitted for privacy or other reasons).

	6 years	7 years	8 years	9 years	10 years
Mean	29840.47	32655.21	33916.03	36128.21	37184.49
10th Percentile	18440	19800	20300	21800	22150
25th Percentile	22400	24300	24700	26700	27300
Median	27900	30300	31400	33700	34500
75th Percentile	34300	37700	39300	41800	43300
90th Percentile	43400	48000	50300	52800	54750
StDev	22580.93	24526.63	26418.74	27624.66	29542.33

The Census Bureau estimate of the real median household income in the United States was \$53,657 in 2014. From the numbers, a household of two college graduates just 2 years post-graduation makes an average of \$59861.34, higher than the median income across the country. This is a reasonable assumption, given that the average household size is 2.58 people (2010 Census data). Two graduates making the median income, while receiving a bit less, also make more than the median income nationwide. Furthermore, the average growth rate of a recent graduate's compensation, calculated on the mean of earnings, is 5.7% annually. Average raises for American workers were reported to be 3% in 2013.

Looking further at the distribution of the mean earnings post-enrollment, there is a large degree of positive skew.

Mean Earnings 6 years post-enrollment

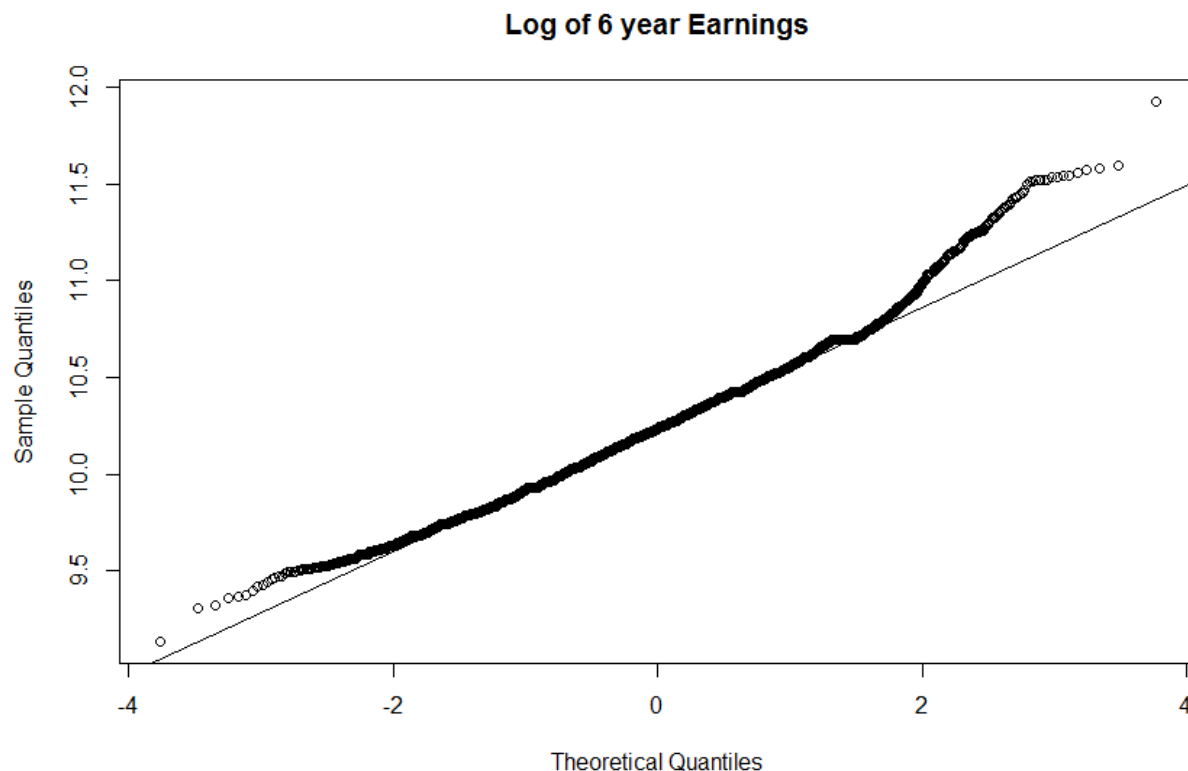


While the QQ-plot is shown for only the 6 year post-enrollment earnings, the QQ-plots for the rest look similar. So while the majority of schools' graduates earn around the mean of \$29,840.47 2 years after graduation, there are a significant number of schools that are positive outliers, with graduates making much more on average.

These results both support and contradict the doom-and-gloom belief among many young adults that there is little value in attending college. The mean compensation for college graduates slightly surpasses that of the average American household, but it does not factor in the costs of tuition and student debt, which likely change the story. However, with just a bit of preliminary research, it should be easy for a prospective student to identify several positive outlier schools, whose graduates make significantly more than the average. With so many, the chances of admittance to at least one are not slim. Just a small amount of work – made all the easier by public access to this data – makes it likely for said student to land a much higher paying job.

Keeping in mind the nature of the samples – drawn from college graduates who received federal financial aid – and things look even rosier. It seems reasonable to hypothesize that students that are from more well-off families will tend to land even higher paying jobs, from connections and other status effects. Of course, that is just a hypothesis. What we can support is the statement that college has a tangible and relevant effect on future income. To make a truly definitive statement on whether college is worth the investment, comparisons to the incomes of workers without college educations will need to be made.

Next, we transform the mean earnings data with a logarithmic transformation, which produced more normal results than the square root.



With the transformed data, we can make a normal approximation. Then, a confidence interval for the population mean of graduate earnings can be calculated. Because we are using log transformed data, however, the Cox method must be used instead of the normal methods taught in class. The interval is calculated for $\log(\theta)$ as $\bar{Y} + \frac{S^2}{2} \pm z_{\alpha/2} \sqrt{\frac{S^2}{n} + \frac{S^4}{2(n-1)}}$ where \bar{Y} is the mean of the log transformed data, and S the standard deviation of the log transformed data. Then antilogs are taken for the true confidence interval. The 95% confidence intervals for the population mean, calculated using this method, are displayed:

	Left	Right
6 yrs	29492.58	30009.25
7 yrs	32248.74	32838.55
8 yrs	33459.05	34089.61
9 yrs	35674.09	36341.38
10 yrs	36696.53	37393.8

So our sample means are likely not far off from the true values. Still, keep in mind that the "population mean" is still referring to the earnings of graduates that have received financial aid. They may systematically differ from graduates who have not.

What of Penn specifically? The relevant statistics are displayed below:

	6 years	7 years	8 years	9 years	10 years
Mean	92300	102200	106600	104600	113400
10th Percentile	23500		24100		22700
25th Percentile	44500		47400		49900
Median	67400		73200		78200
75th Percentile	107300		118600		129500
90th Percentile	191500		224500		236200
StDev	89800	110500	115900	115800	126200

For individual schools, percentile data is only available in select years.

There is an enormous difference between the compensations received by Penn graduates and the compensations received by college graduates in general. Needless to say, this is not a surprising finding. Penn is a prestigious school with many professional connections that feeds students into very lucrative career paths. What is interesting is the enormous gap between the 75th and 90th percentiles. The 90th percentiles are 78.5%, 89.3%, and 82.4% increases over the 75th percentiles, respectively – a much more drastic change than in the population. The most likely explanation is that these massive 90th percentile incomes represent successful Wharton students – a small fraction of the overall student body, who enter extremely high-paying fields

(finance). It would be illuminating if data was available separating Penn into its 3 constituent schools, but no such information is available.

Ultimately, while not interesting for our purposes, Penn's numbers should elicit some sighs of relief in current Penn undergrads.

Despite the limitations of the College Scorecard data, it remains an extremely powerful tool for students and parents in making informed decisions about their futures. The transparency and concrete numbers are a substantive step in the right direction.

There is no doubt that college education provided more value in the past. Graduates barely make more than the average American after schooling, with additional student debt on top of other financial burdens. Couple that with ballooning tuitions and an uncertain economy, and it is no wonder that people complain. In the near future, however, more innovative solutions and political pressures will likely force change.

College Scorecard is an admirable first step. Millions of Americans are hoping for more.